

Aeroelastic Simulation Tool for Inflatable Ballute Aerocapture, Phase I

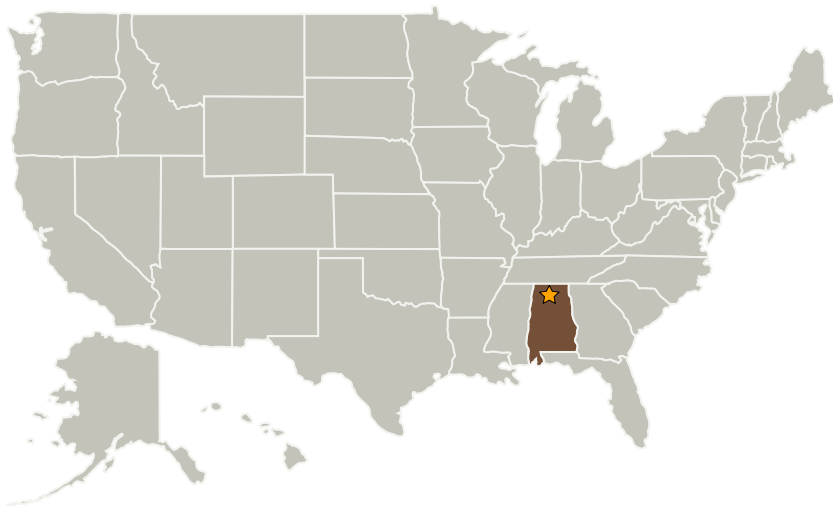
Completed Technology Project (2005 - 2005)



Project Introduction

This project will develop a much-needed multidisciplinary analysis tool for predicting the impact of aeroelastic effects on the functionality of inflatable aeroassist vehicles. High-fidelity computational modules for fluid dynamics, heat transfer, structural dynamics, and dynamic motion will be coupled into a multidisciplinary computing environment. The multi-disciplinary system has been successfully applied for aeroelastic and dynamic simulations of fighter aircraft, hypersonic vehicles and planetary probes. The application range will be extended to the rarefied regime through integration of an existing NASA DSMC flow solver. In Phase I, continuum flow regime sample analyses will be performed for a trailing ballute configuration to demonstrate the capabilities of the software environment. Simulations will demonstrate the insight gained into the aerodynamic, material stress and localized heating effects from various levels of simulation fidelity: steady and unsteady flow, rigid or flexible structure, and static or dynamically moving vehicles. The feasibility of implementing the DSMC flow solver in the multidisciplinary simulation framework will be demonstrated for the case of a steady-state shape deformation prediction. Phase II efforts will focus on fully implementing the DSMC code and other NASA codes in the multidisciplinary environment. Extensive verification and validation studies will be performed, leveraging planned aeroelastic ballute windtunnel tests.

Primary U.S. Work Locations and Key Partners



Aeroelastic Simulation Tool for Inflatable Ballute Aerocapture, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Aeroelastic Simulation Tool for Inflatable Ballute Aerocapture, Phase I

Completed Technology Project (2005 - 2005)



Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations

Alabama

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Peter A Liever

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.3 Aeroelasticity